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Luncheon Address
by
James E. Webb, Administrator
National Aeronautics and Space Administration
at the
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Governor Collins:

It is certainly a wonderful thing that every citizen thanks to radio and television, can personally follow such flights as those of Astronauts Alan Shepard, Virgil Grissom, and John Glenn, with increased comprehension and a growing sense of participation which unites and strengthens the Nation.

These flights are not stunts, nor is their purpose to demonstrate our capacity to put a man in space for a limited time. They are part of a prudently coordinated, step-by-step program to prove the strengths and weaknesses of the combined systems which we call Project Mercury.

I have been told -- and I know you are familiar with these figures -- that the beginning of John Glenn's flight in Friendship 7 was watched in nearly 25 million American homes; that, at one time or another, the progress of this flight was followed on TV in nearly 40 million homes. This was by far the largest audience ever tuned to television during the daytime. It equalled the evening audiences for the four great debates during the 1960 Presidential campaign.

The size of this audience demonstrates the great interest the American people have in space exploration. And this interest attests to the wisdom of the provision in the National Aeronautics and Space Act of 1958 which directed NASA -- in Section 203 of the statute -- "to provide for the widest practicable and appropriate dissemination concerning its activities and the results thereof."

People all over the world also rode with John Glenn. Not since the flight of Charles A. Lindbergh in the Spirit of St. Louis has such a feeling of participation been generated around the globe.

As we take satisfaction in the advantages our open approach has brought us, we must also remember that sooner or later we will again have to take it on the chin -- openly. The modern rocket, with all our precautions, is not a perfected or completely reliable device.

There is a borderline, of course, between giving an event of worldwide interest full public coverage, and in developing what has been called a "carnival atmosphere." I mention this point only to say that neither we in NASA, nor you in this audience, nor the viewing public, can escape this problem. We might also recall together the sober words of the Space Science Board of the National Academy of Sciences nearly a year ago.

"The history of geographic exploration of earth," the Board noted, "tells over and over again of the deaths of bold explorers... To ignore this in the far more difficult and hazardous areas of man-in-space is foolish. Men will perish in space as they have on the high seas, in the Antarctic, in the heart of Africa, and wherever they have ventured into unknown regions."

That warning remains valid. The country has come to know our astronauts quite well. The manner in which they face and react to stress and danger makes them an inspiration to all of us. If we are to ride into space with them via TV, we cannot avoid being there if tragedy strikes.

Perhaps, as a Nation, we can learn that some of the most valuable lessons in space flight come from the failures.

There is little doubt that the advantages growing out of an aroused interest in our space program, a heightened sense of participation, and a better understanding of our scientific and technical strengths at home and abroad, are great assets to the Free World.

The first 60 years of this century have been years of revolutionary change. Empires have fallen. Upheaval has shaken such vast regions of the world as Russia, China, the Middle East. New nations are emerging in the less developed regions. Communist dictatorships have arisen to challenge constitutional democracy and the right of peoples to self-determination.

Paralleling the political upheavals, there has been an all-pervading scientific and technological revolution. Most of the technology basic to teleradio communications has been the product of this century. It is equally true of the growth of the automobile industry, the development of aviation, and the applications of nuclear energy. In the same period came the development of the modern rocket, which enables us to propel man-made devices beyond the earth's atmosphere into space.

Increasingly, the Government has found it necessary to engage in large-scale activities of scientific research and development. We began this in World War II with the Manhattan District atomic energy project, originally oriented entirely toward military needs. But after the war, Congress passed an Act that placed atomic energy development under a civilian agency. Military requirements were to be satisfied, but the Act specified that efforts which would not violate security should be applied through the Commission for the general welfare.

A few years later, in the broader fields of all the sciences, the 1950 Act creating the National Science Foundation established the goal of stimulating science for the general welfare.

As rocket technology progressed and gave promise of opening the Space Age, we passed another milestone. In 1958, Congress decided to create a new civilian agency of Government, which would have thorough scientific and technological competence in the aeronautical and space fields. Again, Congress acted to assure that space science and technology would be used for the general welfare.

The new agency, the National Aeronautics and Space Administration, was built around the National Advisory Committee for Aeronautics, the Jet Propulsion Laboratory of the California Institute of Technology, and the Army's von Braun group at Huntsville, Alabama.

The law requires of NASA a long-range plan, and this was established under the Eisenhower Administration. That plan laid out a progression of space research and exploration events toward which to work over a period of 15 years.

Last year, when faced with ever more-rapid Soviet progress in space, President Kennedy reviewed this long-range plan. He determined with the help and advice of Vice President Johnson and the National Aeronautics and Space Council, that it is feasible to compress 15 years of progress under the old plan into a decade under a new plan. The President proposed, and Congress endorsed, a program to do just that.

Now briefly, what is in our national space program?

First, we are conducting vigorous, broad-scale scientific investigations in space. It is basic research that takes advantage of the new tools that the technology of the rocket has made available.

The dramatic accomplishments in manned space flight programs may overshadow in public awareness the significant progress we are making in the fields of the space sciences. The origin and history of the solar system are among the most intriguing unanswered questions for which scientific devices in our unmanned spacecraft are seeking answers.

To learn about conditions at distances of from 20 to 100 miles from the earth -- and sometimes out to several thousand miles -- we employ sounding rockets. Many sounding-rocket flights are conducted from the NASA station at Wallops Island, off the eastern shore of Virginia. For altitudes above 100 miles but still relatively near the earth, we launch instrumented satellites. And to the more distant regions of the solar system, we send out deep-space probes -- one of which, Pioneer V, radioed back information from 22 million miles distant in space from the earth.

The ionosphere, so important to radio communications, is now accessible to direct analysis. The structure and composition of the high upper atmosphere, cosmic rays in interplanetary space, charged particles, meteoric dust, solar phenomena, surface meteorology, magnetic storms, and inter-relations between various phenomena are but a few of the areas in which systematic study promises a deeper understanding. This deeper understanding yields information useful in communications, in meteorology, in navigation, and in the design and operation of manned space vehicles.

The space sciences program is a quest for fundamental knowledge, which we undertake on its own merits as research. Without programs for basic research, our reservoir of knowledge, from which all technological, or practical, developments must grow, would soon run dry.

It may sound paradoxical, but we are convinced that in the long run most of the practical benefits from space will be attained from research in areas in which we have no advance assurance of success. The only way we can really advance knowledge is to explore the unknown. If we were content to investigate areas where we knew what we could expect to learn, we would miss many new and valuable clues to a broader understanding of nature's basic laws and of how to use them for practical benefits.

Let me give you an example. Suppose we had laid out a program five or six years ago, directly tied to manned space flight. We would never have discovered the Great Radiation Belt, which not only constitutes one of the severest manned-flight problems we face, but which is also a phenomenon of the near-space region around the earth that we must measure and understand to take the next steps in many other fields.

Five years ago, the prevalent scientific opinion was that cosmic rays would be no hazard to manned space flight.

But because science knew so little about cosmic rays, the first U.S. satellites were instrumented to learn more about them. As a result, Dr. Van Allen was able to discover the great radiation blanket about the earth. There may be other hazards to man-in-space, whose existence we do not even yet suspect. And the way to learn of them is to carry out basic research in space.

The space sciences program has a very broad scope. It covers many disciplines, including physics, the biological sciences, chemistry, and astronomy. It crosses the specialty lines, bringing together scholars from widely differing fields. It will stimulate and contribute to the entire spectrum of knowledge, increasing its usefulness here on earth as well as out in space.

Although we know that the solar system was formed more than four billion years ago, <u>how</u> it was formed has been the subject of much thought and speculation for centuries. Investigations of the origin of the solar system by instruments carried to the moon and to the planets is of the greatest scientific importance.

The exploration of space began with the launching of unmanned satellites and space probes carrying scientific apparatus out beyond the earth's atmosphere. These new tools of scientific research promise to advance our understanding of the space environment and of many phenomena studied previously only by indirect means.

The moon is a primary target in our space program because its surface has preserved the record of its history for a much longer period than has the earth. Thus, examination of the moon's surface at close range will carry us back very far into the early history of the solar system; perhaps not back to the birth of the sun and planets, but certainly billions of years into the past -- much longer ago than the 10 to 20 million years during which surface events, still decipherable today, transpired on the earth.

Not only the surface but also the internal structure of the moon may provide clues to the early history of the solar system and to the birth of the planets.

Whether they were created during a near collision between our sun and other stars, or formed out of pockets of condensation in the dust surrounding our sun in the early stages of its lifetime, is one question which we hope to answer. When known, this answer will provide a vital link to future scientific discoveries.

Initially, our program of unmanned lunar and planetary exploration will utilize Ranger spacecraft carrying instruments designed specifically to obtain information on the environment and structure of the moon. This 750-pound spacecraft will also contain a TV system which will transmit images of the moon's surface features to earth with a degree of detail many times greater than those now obtainable from our best earth-based telescopes.

We have already flown three of the nine spacecraft in the Ranger program, with further flights planned in 1962 and 1963.

Following Ranger will come the Surveyor project, with flights planned in 1963 and through 1965. It has two objectives: first, soft landing about 350 pounds of instruments in selected areas on the visible side of the moon for detailed studies of localized surface characteristics and measurements of the lunar environment; and, second, orbital flights around the moon for extensive mapping. The parent spacecraft, when it leaves the earth, will weigh about 2,500 pounds for landing missions and somewhat less for orbital missions.

The mapping mission is new, developed to assist in selection of landing sites for the Manned Lunar Landing Program. Surveyor may also be used as a long-lived satellite of the moon to monitor radiation and other environmental and geophysical phenomena.

During 1963, NASA will undertake a more detailed study of the Prospector project which may follow Surveyor. Prospector may involve, among other things, transport of a vehicle capable of moving around on the surface of the moon. At present, it appears that the Prospector spacecraft would be used for carrying significant payloads to the moon in support of unmanned scientific and manned lunar explorations.

Although the space sciences program is developed as sound basic research, the practical values are clearly recognized. Let me cite an example of interest to your industry. The early investigations of the ionosphere with sounding rockets yielded results that make it easier to predict radio frequencies that should be used in worldwide communications. Such improvement makes it possible to keep better communications schedules, and means dollars-and-cents savings to the industry.

We have a vigorous applications program, as such. You gentlemen are all familiar with our communications satellite program. A satellite due for launching in the next few months will carry the first experiment in transatlantic television.

The world needs greatly expanded communications facilities. The capacities of undersea cables and high-frequency radio channels are inadequate to meet projected future demands. Communications satellites provide one element of a solution.

At present, we are in the stage of research and development with communications satellites. There are several types. We are testing them all. The nature of the eventual operational system cannot yet be determined.

In the current program, we are working with other nations to bring about the necessary cooperative arrangements for the joint research and development required. The U.S. Information Agency will aid NASA in planning international communications demonstrations to be conducted with the Telstar and Relay satellites this year. The plans, however, are not yet firm.

Another practical application of satellites is for weather observation and prediction. We have now had four successful TIROS satellite launchings in four attempts. The third TIROS, launched last summer in time for the hurricane season, reported the existence of dozens of storms in advance of conventional ground-based observations. The fourth TIROS, this winter, has provided information on ice conditions in the St. Lawrence. In at least seven cases, information obtained by this satellite has caused significant adjustments in the weather analyses by the U.S. Weather Bureau. The analyses are employed by the airlines in scheduling flights and, indeed, were used in scheduling John Glenn's orbital flight of February 20.

Accurate, worldwide weather information is of tremendous potential value for agriculture, for industry, for transportation, and for the well-being of everyone. In a few years, the United States plans to establish an operational weather satellite network that will do these things and will make it possible greatly to increase human knowledge about the weather -- bringing closer the day when it may be possible to modify the weather.

As recommended by the President, and endorsed by Congress, the United States is going forward with the greatest scientific and engineering undertaking of this century -- the manned exploration of space. The action by the President and the Congress last year established the Manned Lunar Landing Program as a national goal to be accomplished before the end of this decade. Here are some of the things NASA has done in recent months to get this gigantic program under way.

We are establishing a Manned Spacecraft Center at Houston, Texas.

We have contracted for the design, development, and construction of the three-man Apollo spacecraft which will land men on the moon and return them to earth.

We have initiated the Gemini program, as a prelude to Apollo, for rendezvous development and astronaut training.

We have acquired the large Government-owned Michoud Plant at New Orleans, Louisiana, and are converting its 1.6 million square feet of manufacturing space into the largest booster assembly area in the United States. The Saturn and the Advanced Saturn will be assembled here.

We are acquiring 73,000 acres along the Florida Coast, adjacent to the Cape Canaveral launching facilities. In this area, five times the present size of Cape Canaveral, construction will soon start on the largest launch sites in the Free World.

Now, let us look at the manned space flight program, whose first stage is Project Mercury.

The performance of John Glenn in orbit, and that of his fellow astronauts on two earlier Mercury sub-orbital flights, and the flight skill and courage of the pilots who are testing the rocket-powered X-15 -- the world's fastest airplane -- show us that man has a predominant role to play in space exploration. Many X-15 flights would have failed without a man in the cockpit to correct malfunctions of equipment, instruments, or powerplant.

The flights of Astronauts Shepard, Grissom, and Glenn contributed greatly to our knowledge of the effects of space flight on man and his ability to perform useful tasks in space. Each flight was a significant step in the development of technology for further manned exploration of space.

The Glenn mission will be followed by other earth-orbital flights. Modifications of the basic Mercury spacecraft are being made to allow orbital flights lasting up to one day.

The Gemini program will increase our knowledge in two major areas -- weightlessness and rendezvous in earth orbit. In the study of weightlessness, we are interested in learning more about the reactions of man to extended periods of zero gravity and to the space environment. By rendezvous we mean the joining of two objects in earth orbit. Rendezvous would permit rescue, crew transfer, or repair operations in space and lead to establishment of a space platform. In addition, our mission to reach the moon might well be simplified by the rendezvous technique and our time schedule shortened by as much as two years.

In the Gemini program, an Atlas booster will launch an unmanned and modified Agena-B vehicle into orbit. When the orbit of this vehicle has been carefully determined, a manned Gemini spacecraft will be launched by a Titan II in such a way that these two vehicles -- the Atlas booster and the Gemini spacecraft -- could be coupled together in space. The final joining of the two vehicles will be controlled by the men in the Gemini capsule. All this has to be done while traveling at speeds of nearly 18,000 miles per hour.

Apollo, our program for manned exploration of the moon, will require a payload of approximately 150,000 to 200,000 pounds. For this reason, we need the tremendous thrusts we are developing in our large Saturn boosters. The large payload requirement is also the reason for our consideration of rendezvous in earth orbit as a means of getting to the moon. By the rendezvous technique, we would be able to launch the Apollo escape and mission vehicles into earth orbit.

To go directly from the earth to the moon, would require the thrust of the giant Nova booster which will be about 300 feet tall, not including the spacecraft. The Nova first stage will generate approximately 12 million pounds of thrust. Today we are carrying our studies that will lead to contract awards for developing the various stages of Nova.

The money expended in all these programs will not be fired off into space. It will be spent in the Nation's factories, workshops, and laboratories for salaries, materials, supplies, and services.

The national enterprise involved in meeting our accelerated space goals is an activity of critical impact on the future of the United States as an industrial and military power, and as a leader of the Free World.

Despite our most modern means of communication, the world today is split and divided. Perhaps in space will be found the new dynamic force that mankind has been seeking, the force that will help unite peoples in common undertakings and understanding.

Some historians and psychologists see activity in space as providing a constructive substitute for war. The demands for individual selflessness and national teamwork are similar, they say, and the premium on vision, daring, and hard-driving effort is as great.

If men must do battle, how much more worthy of civilized nations it is to seek to conquer the hostile environment of space and leave their neighbors in peace.

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